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09/847,511	05/02/2001	Yu-Hsi Wang	67,200-404	7868

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TUNG & ASSOCIATES  
Suite 120  
838 W. Long Lake Road  
Bloomfield Hills, MI 48302

EXAMINER

KORNAKOV, MICHAIL

ART UNIT	PAPER NUMBER
1746	

9

DATE MAILED: 11/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/847,511

Applicant(s)

WANG ET AL.

Examiner

Michael Kornakov

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 August 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

1. The finality of last Office action is withdrawn due to new grounds of rejection presented below.
2. Claims 1-20 are currently pending in the Application.

### ***Claim Objections***

3. Claims 8 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 8 recites the limitations of a stripper solution. The stripper solution is initially recited in claim 1, as a liquid that fills the tank body. While the tank body is a structural limitation of an apparatus as claimed, the stripper solution IS NOT a structural element of an apparatus. Therefore, by only adding a limitation on a nature of stripper solution, claim 8 fails to further limit claim 1, and in condition as currently presented the claim 8 is not treated on the merits.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claims 10 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 10 and 11 recite the limitation of "further comprising the step of filling the tank body with a stripper solution..." However, claim 9 on which claims 10 and 11 depend recites the step of "...providing a tank body and filling the tank body with a volume of stripper solution;". It is unclear if an additional stripper solution is added, or the limitation of claims 10 and 11 just refers to the nature/chemistry of a stripping solution. Correction and/or clarification is required.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Komatsuzaki (U.S. 4,417,945).

Komatsuzaki discloses apparatus for any liquid treatment of a wafer (abstract). The apparatus of Komatsuzaki comprises treatment vat (reads on tank body) with treatment solution, means for holding the wafer(s) in vertical position and means for reciprocally moving the wafers' holding means with wafer(s) being immersed into

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**the treatment solution**. The wafer holding means are moved **reciprocally** up and down by a mechanism with a cylinder and a piston (see Abstract, col.1, lines 6-12; col. 2, lines 15-37; col.3, lines 46-63; col.4, lines 60-65; col.5, lines 58-62; Fig.4 and 5).

With regard to the limitation of the instant claim 1, that the "...wafer is immersed in a stripper solution at a frequency of not more than 100 cycle/min", it is noted that such limitation is not relevant to the apparatus claims, because what defines the patentability of apparatus, is its structural elements, but in no way the method by which it operates. In other words, apparatus claims must be structurally distinguishable from the prior art in terms of structure not function. ***In re Danley***, 120 USPQ 528, 531 (CCPA 1959); Hewlett-Packard Co. V. Baush and Lomb, Inc., 15 USPQ2nd 1525, 1528 (Fed. Cir. 1990);

Therefore all structural elements of apparatus as per instant claims 1, 5 and 6 are met by Komatsuzaki, and are therefore anticipated by this reference.

6. Claims 1, 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Weber et al (U.S. 5,922,431).

Weber teaches device for treating substrates, such as semiconductor wafers. The device of Weber comprises fluid container (reads on "tank", as instantly claimed) into which liquid chemicals can be introduced (col. 5, lines 29-35), an overflow opening via which the fluid entering the container can flow out (col.8, lines 33-35), wafer receiving device (reads on "wafer holder", as instantly claimed) and means for lifting and lowering or reciprocating vertically the wafer receiving device (col.7, lines 49-53). The

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liquid media is contained within the fluid container during wafer processing (col.8, lines 17-35). Therefore, the device of Webber is fully capable of holding, immersing and reciprocating at least one wafer being in vertical position. The device of Weber also comprises heating means for heating the fluid contained in said fluid container (col.6, lines 38-41). Therefore, the limitations of claims 1 and 2 are met by Weber.

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 2, 9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki in view of Erk et al. (U.S. 5,593,505).

With regard to claim 2, Komatsuzaki remains silent about the use of heating means for heating the treatment solution, as per claim 2. However, the heating of treatment solutions is widely utilized in the art in order to enhance cleaning efficiency.

Erk discloses method of cleaning semiconductor wafers and in order to enhance semiconductor cleaning process Erk utilizes reciprocal motion of wafers, which are placed in the bath. Erk also indicates that raising the bath temperature is beneficial for cleaning procedure (col.3, lines 28-29). Therefore the heating means are inherent in the teaching of Erk.

Because both Komatsuzaki and Erk are concerned with liquid treatment of semiconductor wafers and Erk indicates the benefits of raising the bath temperature, one skilled in the art, motivated by the disclosure of Erk, at time the invention was

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made, would have found it obvious to provide the heating means in order to obtain and maintain the desired temperature of treatment solution in the apparatus of Komatsuzaki.

With regard to the method for removing unwanted film layers, as per instant claims 9 and 15, Komatsuzaki discloses a method comprising the steps of providing a tank with a stripper solution, provides a wafer holder that holds a wafer in a vertical position, as instantly claimed, and the wafer holding means is moved reciprocally up and down by a mechanism with piston and cylinder (Abstract, col.1, lines 6-12; col. 2, lines 15-37; col.3, lines 46-63; col.4, lines 60-65; col.5, lines 58-62; Fig.4 and 5). After completion of liquid treatment in the treatment vat, the wafer is dump rinsed in the rinse vat 16 (col.5, lines 8-12).

The teaching of Komatsuzaki differs from the instant claims by not indicating a specific frequency value of up and down motion. In addition to other semiconductor cleaning means and techniques, in order to enhance semiconductor cleaning process Erk also utilizes reciprocal motion of wafers. Erk provides the range of reciprocating rates from 20 cycles/min to 240 cycles/min and states that the reciprocating rate affects the processing time (col.6, lines 28-31). Erk also discloses the preferable reciprocating rate of at least 60 cycles/min as one of his processing parameters.

Because the reciprocal motion of the substrate is an important element in treatment techniques of Komatsuzaki and Erk, and Erk teaches that the reciprocating rate affects the processing time and, therefore, the cleaning results, one skilled in the art at the time the invention was made, motivated by the teaching of Erk would have

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found it obvious to utilize the preferable reciprocating rate of Erk while optimizing the value of reciprocal frequency and cleaning the wafer in a timely manner in the teaching of Komatsuzaki with the reasonable expectation of success.

8. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weber et al. (U.S. 5,992,431) in view of Applicants' admittance or separately over Komatsuzaki in view of Applicants admittance.

In regard to claims 3 and 4, which are concerned with specific design of wafer holders, it is noticed here that the claimed wafer holders are typical holders, commonly and widely used in the art (paragraph, bridging pages 16 and 16 of the instant disclosure). Therefore, one skilled in the art would have found it obvious to utilize the conventional wafer holders in the apparatus of Weber or Komatsuzaki in order to provide economical and technologically compatible equipment for semiconductor wafer(s) treatment.

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weber in view of Cardani et al. (U.S. 5,003,999).

While teaching the use of heating means, the disclosure of Weber is silent about the utilization of **electrical** heating means. However, conventionally controlled electrical resistors as heating means for liquid processing baths are notoriously utilized in the art of wet processing of semiconductor wafers, as provided by Cardani (paragraph, bridging col.1 and 2).



Therefore, one skilled in the art, motivated by the teaching of Cordani, would have found it obvious to utilize the electrical heating means, as disclosed by Cordani, in order to provide precise and convenient control of temperature of the treatment solution in the teaching of Weber.

10. Claims 10, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Ward et al. (U.S. 5,988,186).

The combined teaching of Komatsuzaki and Erk does not specifically provide for the stripper solution that comprises DMSO and TMAH. However it indicates that the disclosed apparatus can be used for any liquid treatment of any plate like materials, thus motivating the skilled artisan to explore different treatment solutions in semiconductor processing.

Ward teaches an aqueous composition, comprising DMSO and TMAH (see example in paragraph, bridging col.6 and 7), which is useful for treatment wafer surfaces during the fabrication of integrated circuits (paragraph bridging col.4 and 5; col. 5, lines 3-31). The composition of Ward is non-corrosive, non-flammable and of low toxicity to the environment.

Because both the combined teaching of Komatsuzaki and Erk and Ward are concerned with liquid treatment of semiconductor wafers and Ward provides for the environmentally safe and non-toxic treatment composition, one skilled in the art, motivated by the teaching of Ward, would have found it obvious to utilize the treatment

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composition of Ward in order to provide non-corrosive and environmentally safe treatment media and treat the wafers in combined teaching of Komatsuzaki and Erk with the reasonable expectation of success.

11. Claims 12, 13, 16, 17 and 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki and Erk, as discussed above and in view of Noguchi (U.S. 4,657,631).

The combined teaching of Komatsuzaki and Erk does not specifically indicates the step of stationary soaking the wafer in treatment solution for a definite amount of time.

Noguchi teaches removal of a solid layer of photosensitive material from the substrate surface by **stationary soaking** the substrate in a liquid, which is capable of dissolving the photosensitive solid layer followed by agitation of the substrate in order to accelerate the removal process.

Because both the combined teaching of Komatsuzaki and Erk and Noguchi are concerned with liquid treatment of substrates and Noguchi emphasizes acceleration of treatment by stationary soaking the substrate in a processing liquid, one skilled in the art motivated by the disclosure of Noguchi would have found it obvious to soak the substrate in the process of Komatsuzaki and Erk separately from its agitation in order to process the substrate in a timely manner.

In regard to soaking time, it is noted that this parameter is result effective, because the required dissolving or, alternatively, swelling of the removable layer

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depends on the characteristics of this particular layer, applied solution and on the duration of dissolution or swelling step. However, discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

12. Claim 14 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Komatsuzaki (U.S. 4,417,945) in view of Erk et al. (U.S. 5,593,505) and in further view of Handbook of Semiconductor Wafer Cleaning Technology (hereinafter referred to as The Book).

The combined teaching of Komatsuzaki and Erk remains silent about spin drying of wafer(s) after processing. However, the drying of wafers after processing is notoriously used and recognized in the art of semiconductor technology as an extremely critical step, and the spin drying is the most widely utilized drying technique, as provided by the Book (page 24, paragraph 3.5).

Therefore, one skilled in the art, motivated by the teaching of the Book, would have found it obvious to spin dry wafer(s) in the teaching of Komatsuzaki and Erk, after their rinsing, in order to prevent re-deposition of unwanted elements onto the wafer's surfaces and provide for the proper storing.

13. Claim 18 stands rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki, Erk and Noguchi (U.S. 4,657,631) and in further view of Ward et al. (U.S. 5,988,186).

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The combined teaching of Komatsuzaki, Erk and Noguchi applied to independent claim 16 does not specifically provide for the stripper solution that comprises DMSO and TMAH. However it indicates that the disclosed apparatus can be used for any liquid treatment of any plate like materials, thus motivating the skilled artisan to explore different treatment solutions in semiconductor processing.

Ward teaches an aqueous composition, comprising DMSO and TMAH (see example in paragraph, bridging col.6 and 7), which is useful for treatment wafer surfaces during the fabrication of integrated circuits (paragraph bridging col.4 and 5; col. 5, lines 3-31). The composition of Ward is non-corrosive, non-flammable and of low toxicity to the environment.

Because both the generic teachings of Komatsuzaki Erk and Ward are concerned with liquid treatment of semiconductor wafers and Ward provides for the environmentally safe and non-toxic treatment composition, one skilled in the art, motivated by the teaching of Ward, would have found it obvious to utilize the treatment composition of Ward in order to provide non-corrosive and environmentally safe treatment media and treat the wafers of Komatsuzaki and Erk with the reasonable expectation of success.

14. Claim 19 stands rejected under 35 U.S.C. 103(a) as being unpatentable over combined teaching of Komatsuzaki, Erk, and Noguchi, as discussed above and in further view of Handbook of Semiconductor Wafer Cleaning Technology (The Book).

The combined teaching of Komatsuzaki, Erk and Noguchi remains silent

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about spin drying of wafer(s) after processing. However, the drying of wafers after processing is notoriously used and recognized in the art of semiconductor technology as an extremely critical step, and the spin drying is the most widely utilized drying technique, as provided by the Book (page 24, paragraph 3.5).

Therefore, one skilled in the art, motivated by the Book, would have found it obvious to spin dry wafer(s) in the teaching of Komatsuzaki, Erk and Noguchi, after their rinsing, in order to prevent re-deposition of unwanted elements onto the wafer's surfaces and provide for the proper storing.

### ***Response to Arguments***

15. Applicant's arguments with respect to claims 1-8 drawn to an apparatus have been considered but are moot in view of the new ground(s) of rejection.

16. Applicant's arguments with regard to the method claims filed 01/27/2003 have been fully considered but they are not persuasive.

Applicants argue that there is no motivation to combine references to Komatsuzaki and Erk in rejection of claims 9 and 15 because, as stated in Brief, Komatsuzaki does teach the up and down motion, but does not teach frequency. Erk teaches the cleaning by passing wafers through gas-liquid interface, and as acknowledged in brief, Erk also teaches ***reciprocal up and down movement, which is most effective near the gas liquid interface*** (emphasis added - M.K.), and since Erk in Applicants' opinion, teaches half of the wafer immersed, and Komatsuzaki teaches

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the whole wafer immersed, therefore, there is no motivation to combine these two references.

In response to applicant's argument, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, both Erk and Komatsuzaki teach wet chemical treatment of semiconductor substrates and **both teachings comprise the same process enhancement technique**, namely the reciprocal motion of the substrate positioned in the processing liquid. Erk states that the reciprocating rate affects semiconductor processing time and that sufficient reciprocating rate leads to accelerated cleaning, therefore exposure to other treatment tools (techniques) can be minimized (col.6, lines 28-37). Erk also discloses the preferable reciprocating rate of at least 60 cycles/min as one of his processing parameters. Therefore, one skilled in the art at the time the invention was made, motivated by the teaching of Erk would have found it obvious to utilize the preferable reciprocating rate of Erk in order to accelerate treatment of semiconductor substrate in the teaching of Komatsuzaki with the reasonable expectation of success.

It is also noted that had Erk taught the exact same process as Komatsuzaki does with the claimed frequency of motion, the Erk reference would have been used alone as a 102 reference.

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In response to the argument that Erk does not teach a method in which a wafer is **completely** immersed in a stripper solution, Applicants are advised that the features upon which applicant relies (i.e., **completely** immersing) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

All other arguments of Applicants are based on alleged incompatibility of Komatsuzaki's and Erk's references and have been addressed above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (703) 305-0400. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (703) 308-4333. The fax phone number for the organization where this application or proceeding is assigned is (703) 872 9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308 2450.

*M. Kornakov*

Michael Kornakov  
Examiner  
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